

PLAKSIN, I.N.; SOLNYSHKIN, V.T.

Effect of a caustic soda solution on beryl surfaces during
preparation for flotation. Izv. vys. ucheb. zav.; tsvet. met.
4 no.3:28-36 '61. (MIRA 15:1)

1. Institut gornogo dela AN SSSR i Krasnoyarskiy institut
tsvetnykh metallov.

(Beryl)
(Flotation)

On the quantitative control of ...

28880
S/180/61/000/004/019/020
E032/E514

the grains of the mineral which contain the element to be determined contain the same amounts of the element, then it can be shown that the counting rate due to the secondary particles is proportional to the number of grains. On the other hand, the percentage concentration of the element to be determined β is given by

$$\beta\% = B \frac{I}{d} \quad (17)$$

where B is a constant, I is the counting rate and d is the density of the material. The present authors have investigated the problem experimentally, using synthetic mixtures of fluorite with various minerals. They made use of the α, n reaction and recorded the neutron emission. It was found that the relation between the counting rate and the concentration of the element under study is not linear but unambiguous calibration curves can be plotted and hence the method may be of practical importance. There are 1 figure and 3 Soviet references (1 a translation from English).

SUBMITTED: June 23, 1960

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On the quantitative control of ...

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S/180/61/000/004/019/020
EO32/E514

$$B = \frac{nq}{2\pi e^2 z^2 \ln \frac{E_{cp} q}{J_{cp}}} \sum_i N_i Z_i \int_{E_{min}}^{E_0} E \sigma(E) dE \quad (8)$$

where N_i is the number of atoms with nuclear charge Z_i per cm^3 and J_{cp} is the average ionization potential. The sum in the denominator can be evaluated from the formula

$$\sum_i N_i Z_i = \frac{\sum_i \frac{\beta_i m}{A_i} N_0 Z_i}{V} \quad (9)$$

where m is the mass of the specimen, V is its volume, β_i is the concentration of the i -th component, A_i is the atomic weight of the i -th component and N_0 is the Avogadro number. If it is assumed that the controlled product can be strictly classified, i.e. all the particles in the specimen have the same dimensions and that all

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On the quantitative control of ...

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E032/E514

particles it is found that

$$B = n \int_{E_{\min}}^{E_0} \frac{\sigma(E) dE}{\frac{2\pi e^4 z^2}{qE} NZ \ln \frac{4Eq}{J}} \quad (6)$$

where q is the mass of the electron divided by the mass of the particle employed, J is the mean ionization potential, z is the charge of the incident particle, and N is the number of atoms with nuclear charge Z per cm^3 of target. Assuming that the logarithmic term is a slow function of E , the latter may be replaced by some average value E_{cp} so that

$$B = \frac{nq}{4\pi e^4 z^2 NZ \ln \frac{E_{cp} q}{J_{cp}}} \int_{E_{\min}}^{E_0} E \sigma(E) dE \quad (7)$$

If the controlled product contains more than a single element, then

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On the quantitative control of ... ²⁸⁸⁸⁰ S/180/61/000/004/019/020
E032/E514
for thin targets. If the target is not thin, then the yield at a
depth x in a layer dx is given by

$$dB = \sigma(x)ndx \quad (2)$$

Hence, if the total thickness of the target is equal to the range
 R , then the total yield is given by

$$B = n \int_0^R \sigma(x)dx \quad (3)$$

For practical purposes it is more convenient to re-write this
expression in the form

$$B = n \int_{E_0}^{E_{\min}} \frac{\sigma(E)}{dE/dx} dE = -n \int_{E_{\min}}^{E_0} \frac{\sigma(E)}{dE/dx} dE \quad (4)$$

Substituting the expression for dE/dx for non-relativistic
Card 2/5

28880
S/180/61/000/004/019/020
E032/E514

21.6000

AUTHORS:

Plaksin, I.N. and Smirnov, V.N. (Moscow)

TITLE:

On the quantitative control of enrichment products using α -radiation

PERIODICAL: Izvestiya Akademii nauk SSSR, Otdeleniye tekhnicheskikh nauk, Metallurgiya i toplivo, 1961, No.4, pp.118-122

TEXT:

In a previous paper the present authors showed (Ref.1: DAN SSSR, 1959, Vol.127, No.3; Ref.2: DAN SSSR, 1959, Vol.128, No.6) that the Po^{210} α -particles can be used for analytical purposes. An important characteristic of a nuclear reaction is the number of nuclear transformations per bombarding particle. The probability of a nuclear reaction is characterized by an effective cross-section σ . If the energy of all the bombarding particles is the same (E), then the yield B of the reaction is given by

$$B = \sigma n x$$

(1)

where n is the number of nuclei per cm^3 of the target and x is the thickness of the target in cm. This expression holds only

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Application of α -radiation ...

S/137/62/000/001/018/237
A060/A101

impulses are fed to an integrator and an automatic recorder. As the belt moves further, the product is brought under an end counter, shielded with lead.

I. Margolin

[Abstracter's note: Complete translation]

Card 2/2

S/137/62/000/001/018/237
A060/A101

AUTHORS: Plaksin, I. N., Smirnov, V. N., Starchik, L. P.

TITLE: Application of α -radiation to the automation of the material composition control of the concentration products of certain ores

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 1, 1962, 7-8, abstract 1057 (V sb. "Radioakt. izotopy i yadern. izlucheniya v nar. kh-ve SSSR. V. 4". Moscow, Gostoptekhizdat, 1961, 270 - 276)

TEXT: The authors consider two methods of analyzing ores by means of α -radiation from Po^{210} : neutron radiation analysis and activation analysis. A plane emitter with activity of 250 μ curies, whose fabrication is described, was used in this study as the radiation source. The method of controlling beryllium, fluorite, and hydroboracite ores is described. Calibration graphs are presented. The second method used artificial radioactivity induced by α -particles where an α -emitter from Po^{210} with activity 120 μ curie was used. It is possible to automate the control of Be, F, B, on the basis of the principle of continuous feed of the material tested. The layer of the latter should be evened out upon the belt by a knife. After being amplified the electrical

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Field Session

S/136/61/000/002/006/006
E073/E335

metallurgical Institute of the AS KazSSR), G.S. Berger
(IMS KazSSR), N.A. Suvorovskaya, G.N. Nazarova, L.A. Barskiy
et al (IGD AN SSSR). ✓

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Field Session

S/136/61/000/002/006/006
E073/E335

V.A. Glembotskiy (IGDAN) spoke of increased extraction during beneficiation by separate contact of the collector with the sand and the sludge fractions of the crushed ore.
A.M. Okolovich (IGDAN) spoke of investigation of the jet system of flotation on polymetallic Tekeli ores.
V.I. Klassen (IGDAN) spoke of increasing the technological economic indices of flotation of copper ores by increasing the initial speed of flotation by means of improved aerating of the pulp.
Kuchayev (Dzhezkazgan Beneficiation Works) spoke of increased extraction of coarse-grain copper minerals by applying neutral hydrocarbon gases.
V.V. Rodzayevskiy (Balkhash Combine) and K.B. Lebedev, Alma-Ata, (Institut metallurgii i obogashcheniya AN KazSSR - Institute of Metallurgy and Ore Beneficiation, AS KazSSR) spoke of investigation of the behaviour of rhenium in beneficiation processes and methods of extracting rhenium from solutions and dusts.

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S/136/61/000/002/006/006
E073/E335

Field Session

metal ores.

M.I. Gorodetskiy (Balkhash Combine) spoke of establishing the relation between the effect of fine sludges on the viscosity of the pulp and the effectiveness of flotation of certain ores. He also studied the possibility of influencing the viscosity of a number of reagents for the purpose of reducing the adverse influence of fine sludges on flotation.

V.I. Klassen (IGDAN) spoke of the mechanism of activation in gas flotation.

V.A. Glembotskiy (IGDAN) presented a paper on the interaction of reagents with minerals and improvement of this process by combining flotation reagents with the use of ultrasonics. ✓

V.I. Tyurnikova spoke of a new reagent flotation regime which is being applied for oxidized molybdenum ores.

M.I. Gorodetskiy spoke of the flotation of ores of Kounradskiy origin which are difficult to filter.

N.Ye. Plaks and D.M. Adorova (Balkhash Molybdenum Works) spoke of investigations relating to increased extraction of molybdenum from the ores and from the concentrates.

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E073/E335

Field Session

stated that the team of the copper-smelting plant had increased appreciably the initially scheduled capacity of the plant and that work was proceeding on these lines. I.N. Plaksin presented a paper "On Certain Scientific and Technical Trends in the Development of Ore Beneficiation". He mentioned experimental work by V.I. Tyurnikova and others at the Balkhash Plant relating to the effect of reagents on improving the flotation of oxidized molybdenum ores. New data were mentioned on applying ion-exchange resins for controlling the ion state of the flotation medium in extracting rare and precious metals from solutions (work of the LGD AN, Institute of Non-ferrous Metals im. M.I. Kalinin, TsNIGRI and others).

Of practical interest is the possibility of regenerating reagents and new apparatus (columns) for filter-less hydro-metallurgical processes. Also of practical interest in lead-zinc undertakings is the simultaneous action of collector reagents of a single type (for instance, xanthogenates) on the flotation of Pb-Zn and other non-ferrous

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S/136/61/000/002/006/006
E073/E335

AUTHOR: Plaksin, I.N.

TITLE: Field Session of the Beneficiation Section of the
Scientific Council of IGD AN SSSR in Balkhash

PERIODICAL: Tsvetnyye metally, 1961, No. 2, pp. 84 - 86

TEXT: Field sessions were held in Balkhash from November 29 - December 1, 1960 and in Karaganda from December 3 - 4, 1960 of the Section of Ore Beneficiation of the Institut gornogo dela Akademii nauk SSSR (Institute of Mining of the AS USSR), in which 120 and 210 people participated in Balkhash and Karaganda, respectively. The main aim of these meetings was to strengthen the relations between scientists and industry. 32 papers were read at each meeting by members of the AS USSR as well as by employees of the mining-metallurgical undertakings and establishments from Kazakh SSR. The general problems of development of ore beneficiation and the main trends were discussed.

The Balkhash meeting opened with an address by the Chief Engineer of the Balkhash Combine, Yu.K. Pobedonostsev, who
Card 1/6

BA.SKIY, L.A. (Moskva); PLAKSIN, I.F. (Moskva); TYURNIKOVA, V.I. (Moskva)

Increasing the efficiency of hydroxyl collectors. Izv. AN SSSR. Otd.
tekh. nauk. Est. i topl. no.1:152-156 Ja-7 '61. (Izv. 14'2)
(Flotation--Equipment and supplies)

PLAKSIN, Igor' N., KLASSEN, V. I.

"Froth flotation processes."

To be submitted for the Gordon Research Conferences, New London, New Hampton, Meridan,
and Tilton, N. H., 12 Jun-1 Sep 1961.

Head of the Section of Mineral Dressing, Institute of Mining of Academy of Sciences USSR.

PLAKSIN, Igor' N., OLOFINSKIY, N. F.

"Electrostatic cleaning."

To be submitted for the Gordon Research Conferences, Chemistry of Coal, New Hampton, N.H.
13-16 June 1961.

Institute of Mining of Academy of Sciences USSR.

PLAKSIN, I. N. and OLOFINSKIY, N. F.

"Electric Preparation of Materials with Fibrous Texture
(Example of Raw Chrysotile-Asbestos Ore)"

Report presented at the Colloquy on Preparation of Anorganic Non-Metallic
Minerals, Freiberg, GDR, 29-30 Aug 61

GLEMBOTSKIY, Vladimir Aleksandrovich; prof. dokt. tekhn. nauk; KLASSEN, Villi Ivanovich, prof. dokt. tekhn. nauk; PLAKSIN, Igor' Nikolayevich; POL'KIN, S.I., otv. red.; RYKOV, N.A., red. izd-va; KACHALKINA, Z.I., red. izd-vo; SAL'TSOVSKIY, M.S., red. izd-va; PROZOROVSKAYA, V.L., tekhn. red. BOLDYREVA, Z.A., tekhn. red.

[Flotation] Flotatsiia. Pod obshchei red. I.N. Plaksina. Moskva, Gos. nauchno-tekhn. izd-vo lit-ry po gornomu delu, 1961. 547 p.

(MIRA 14:5)

1. Chlen-korrespondent AN SSSR (for Plaksin)
(Flotation)

Radioactive Isotopes and Nuclear (Cont.)

SOV/5592

of Microcomponents of Natural Waters

Polyanova, Ye. M., K. A. Kuznetsova, I. D. Myachenkova, I. K. Puzgrev, and B. A. Sokolov. Preventive Control of the Drilling Tool Damage From a Coal Seam While Drilling Inclined Boreholes in Lean Seams.

Abdullayev, A. A., Ye. M. Lebanov, A. P. Novikov, and A. A. Khaydarov. Rapid Determination of the Percentage of Lead in Ores and Concentrates

Plaksin, I. N., V. M. Smirnov, and L. P. Starchik. Application of Alpha Radiation for the Automatic Regulation of the Material Composition of Enrichment Products of Certain Ores

Lenin, S. S. Scintillation Eammeters

Card 10/11

Radioactive Isotopes and Nuclear (Cont.)

304/5592

development of radioactive methods used in prospecting, surveying, and mining of ores. Individual reports present the results of the latest scientific research on the development and improvement of the theory, methodology, and technology of radiometric investigations. Application of radioactive methods in the field of engineering geology, hydrology, and the control of ore enrichment processes is analyzed. No personalities are mentioned. There are no references.

TABLE OF CONTENTS:

Alekseyev, F. A. Present State and Future Prospects of Applying the Methods of Nuclear Geophysics in Prospecting, Surveying, and Mining of Minerals 5

Dulashkevich, Yu. P., G. M. Voshkoboynikov, and L. V. Muzyukin. Neutron and Gamma-Ray Logging at Ore and Coal Deposits 19

Gordeyev, Yu. I., A. A. Mukher, and D. M. Srebrodel'skiy. The

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PLAKSIN, L.N.

TRUSS I BOOK EXPLOITATION 161/559

Vsesoyuznoye soveshchaniye po vnedreniyu radioaktivnykh izotopov i yadernykh izlucheniyy v narodnom khozyaystve SSSR. Riga, 1960.

Radioaktivnyye izotopy i yadernyye izlucheniya v narodnom khozyaystve SSSR; trudy Vsesoyuznogo soveshchaniya 12 - 16 aprelya 1960 g. Riga, v 4 tomakh. t. 4: Peiski, razvedka i razrabotka poleznykh iskopayemykh (Radioactive Isotopes and Nuclear Radiation in the National Economy of the USSR; Transactions on the Symposium Held in Riga, April 12 - 16, 1960; in 4 volumes, v. 4: Prospecting, Surveying, and Mining of Mineral Deposits) Moscow, Gostoptekhnizdat, 1961. 204 p. 3,640 copies printed.

Sponsoring Agency: Gosudarstvennyy nauchno-tekhnicheskyy komitet Soveta Ministrov SSSR. Gosudarstvennyy komitet Soveta Ministrov SSSR po ispol'zovaniyu atomnoy energii

Eds. (Title page): N. A. Petrov, L. I. Petresko, and P. S. Savitskiy; ed. of this volume: M. A. Speranskiy; Scientific ed.: M. A. Speranskiy; Executive Eds.: N. N. Kuz'mina and A. G. Ionel',

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PLAKSIN, Igor' Nikolayevich; OKOLOVICH, Anna Mikhaylovna; DMITRIYEVA, Gali Mikhaylovna; MAKTYENKO, Ivan Ignat'yevich; KORYUKOVA, Nina Andreyevna; LEBEDEV, A.K., otv. red.; KACHALKINA, Z.I., red. izd-va; MAKSIMOVA, V.V., tekhn. red.; IL'INSKAYA, G.M., tekhn. red.

[New technology for the dressing of lead-zinc ores] Novaia tekhnologiya obogashcheniya svintsovo-tsinkovoi rudy. Moskva, Gos. nauchno-tekhn. izd-vo lit-ry po gornomu delu, 1961. 127 p.

(MIRA 15:1)

(Ore dressing)

Influence of Various Factors on the
Flotation of Beryls

S/5 1/82/VL/10/02/15
2016/2017

ASSOCIATION: Institute of Geology and Mineralogy, USSR (Mining Institute
of the Academy of Sciences USSR)

SUBMITTED: August 1, 1966

Card 3/3

of beryls from other deposits was improved up to 18% by the use of a soap instead of oleic acid. Sodium oleate with a low Na content (5-15%) proved to be most effective. The effect of the chemical composition of soaps was studied using radioactive sodium tridecylate. They proved

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Influence of Various Factors on the
Flotation of Beryls

S/020/60/135/002/032/036
BO16/BO52

radiometrically and microradiographically that the collector is most irregularly distributed among the mineral particles when a "neutral" soap is used. An increase of the concentration of the hydrogen ions in the pulp considerably improved the flotation of all the beryls investigated. The pH value corresponding to the highest degree of flotation varied considerably according to the chemical composition of the beryls. For some samples the best results were obtained within a rather narrow range (pH 11-12), while for others the pH range was much wider (5.5-12, 7-10). The flotation of beryls from various deposits was shown to depend only slightly on their granulometric composition. Finally, it is noted that the presence of certain elements in beryls (Fe, Ca, Cr, V, Ni, Mg) affects its flotation considerably. Thus, the difficultly floatable beryl sample 2, unlike others, contains chromium, vanadium, nickel, and a large amount of magnesium. Beryl sample 6 whose flotation is comparatively difficult, also contains vanadium. The easily floatable beryl samples 1 and 4, however, contain no vanadium and no nickel. Their chromium content is 10/100%, and magnesium was detected only in minute quantities. There are 3 figures.

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Characteristics of the Hydrophobing Effect S/020/60/135/001/027/030
of Oxygen on the Surface of Sulfide Minerals B016/B067

sufficiently high. A state of the surface at which the Fermi level corresponds to the Fermi level of the own conductivity of the mineral or of that region which contains a minimum amount of electrons and holes proved to be most suitable for the floatability of the galenite particles. The transition from n-type to p-type proceeds irregularly on the mineral surface. Regions are formed with n-type conductivity and regions with p-type conductivity which, on their part, cause an irregular distribution of the xanthogenate between the galenite particles and the surface of the individual particles. The oxygen shortage reduces the floatability of the sulfides, an excess may cause unexpected phenomena. To attain optimum conditions of flotation, the oxygen or other oxidizers must be conditioned in the liquid phase. There are 2 figures and 9 references: 7 Soviet, 1 US, and 1 Dutch.

ASSOCIATION: Institut gornogo dela Akademii nauk SSSR
(Mining Institute of the Academy of Sciences, USSR)

SUBMITTED: July 16, 1960

Card 3/3

Characteristics of the Hydrophobing Effect S/020/60/135/001/027/030
of Oxygen on the Surface of Sulfide Minerals B016/B067

galenite particles with potassium butyl xanthogenate which contained the radioactive isotope S^{35} , always three particle groups were distinguished: a) particles which were completely covered with xanthogenate, b) particles which were irregularly covered with xanthogenate like a mosaic, c) particles with practically no xanthogenate on their surface (Fig. 1). The different behavior of the galenite particles as compared to the xanthogenate anions is explained by the different semiconductor properties of the galenite surface. The action of oxygen which is adsorbed on the mineral surface eliminates this difference. Natural samples of freshly uncovered galenite had, in most cases, n-type conductivity. To examine the thesis that the xanthogenate on the surface of n-type galenite is not fixed, some experiments were made. Fig. 2 shows the radiograph of a galenite particle to which xanthogenate anions were fixed only in the lower part which was previously treated with oxygen. The experimental results confirmed the correctness of the above thesis. The fixing of xanthogenate starts only after the surface of the mineral had been transformed into a p-type semiconductor. This transformation takes place when the concentration of the oxygen molecules or other oxidizers on the surface of the galenite is

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S/020/60/135/001/027/030
B016/B067

AUTHORS: Plaksin, I. N., Corresponding Member/AS USSR, Shafeyev,
R. Sh.

TITLE: Characteristics of the Hydrophobing Effect of Oxygen on
the Surface of Sulfide Minerals

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 135, No. 1, pp. 140-142

TEXT: In earlier papers (Refs. 1-3), the authors found that the xanthogenate is not fixed on a freshly uncovered surface of the sulfides. The surface must be previously treated with oxygen. Theoretically, this has been little investigated. In the present paper, the authors studied the effect of oxygen on the hydrophobing of the sulfide minerals by xanthogenate by taking special account of the semiconductor properties on the surface of the minerals. Galenite was used for the investigations because it is a typical semiconductor of the combined type. On the basis of radiographic studies, the authors observed that the xanthogenate is very irregularly distributed over the galenite particles. In processing freshly crushed

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The Separation of Minerals in a Current of Ions
Produced by an α -Radiation

68811

S/020/60/131/01/023/060
B013/B007

particles) grows with the discharge amperage, and the yield in container II (for the intermediate product) decreases. The ilmenite, which is of high conductivity, transfers its charge to the drum and falls into container I. In container III (for particles with low conductivity) there is always a very small quantity of ilmenite which is mechanically conveyed by garnet particles. In strong discharge currents an efficacious separation of the mineral mixtures is probably attained. For this purpose α -ionizers of high activity must be used. An intense α -ionization may also be used in other devices in which a corona discharge is used for charging mineral particles (e.g. in corona chamber-separators). There are 3 figures.

ASSOCIATION: Institut gornogo dela Akademii nauk SSSR (Institute of Mining
of the Academy of Sciences of the USSR)

SUBMITTED: December 3, 1959

Card 3/3

68811

The Separation of Minerals in a Current of Ions
Produced by an α -Radiation

S/020/60/131/01/023/060
B013/B007

depend not only on the field strength but also on the intensity of the ionizer. A β - and γ -radiation in the case of high penetrability has a lower ionizability than α -radiation. One α -particle produces more than 100,000 ion pairs on its path in air. It is therefore interesting to investigate the possibility of applying α -radiation for the charging of mineral particles in an electric separator. Po-210 served as source of α -radiation. The corresponding electric separator has an α -ionizer mounted to a corresponding holder instead of the corona-forming electrode; this ionizer is located at a distance of 4.2 cm from the surface of the earthed drum. Figure 1 shows the scheme of this electric separator. Figure 2 shows the dependence of the amperage of the ion current produced by the α -ionizer in an electric separator on the voltage between the drum and platinum electrode. With such a high activity of the α -emitter, the saturation current cannot be attained. In this α -ionization electric separator collective ilmenite-garnet concentrates were separated (ilmenite 52.3% and garnet 47.7%). The dependence of the ilmenite content found in a current of negative ions during separation is shown in figure 3. The ilmenite content in container I (for conductive

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21.7100
AUTHORS:

Plaksin, I. N., Corresponding Member
of the AS USSR, Starchik, L. P.

66511
S/020/60/131/01/023/060
B013/B007

TITLE:

The Separation of Minerals in a Current of Ions Produced by
an α -Radiation

PERIODICAL:

Doklady Akademii nauk SSSR, 1960, Vol 131, Nr 1, pp 85 - 86
(USSR)

ABSTRACT:

The present paper deals with the separation mentioned in the title and with the apparatus required in this connection. For the separation of minerals according to their electrical properties corona separators and corona-electrostatic separators are mainly used. The mineral parts to be separated fall from a bunker on to the surface of a revolving earthed drum, and the corona-forming electrode is located at a distance of several centimeters from this drum. The mineral particles get their charge from the ion current originating from the corona-forming electrode after which they are deposited on the surface of the drum. There they are conveyed to a gap, where they are deposited in the corresponding container. In a dependent discharge, a stronger current is obtained, and that at a lower voltage than in a corona discharge. In this case the discharge amperage will

Card 1/3

VLASOVA, N.S.; KLASSEN, V.I.; PLAKSIN, I.N.

Use of aliphatic alcohols in coal flotation. Ugol' 35 no. 4:45-48
Ap '60. (MIRA 14:4)

(Flotation---Equipment and supplies)

PIAKSIN, I.N.

International Mineral Processing Congress. TSvet. met. 33 no.7:
89-93 J1 '60. (MIRA 13:7)

1. Chlen-korrespondent AN SSSR.
(Ore dressing--Congresses)

PLAKSIN, I.N.

Problems in the concentration of minerals. Vest.AN SSSR
30 no.7:78-80 J1 '60. (MIRA 13:7)

1. Chlen-korrespondent AN SSSR.
(Ore dressing)

Application of the Reaction (α, n) for a S/089/60/009/005/001/020
Quantitative Determination of the Contents B006/B070
of Beryllium, Boron, and Fluorine in Dressing Products

B_2O_3 + hydrobaryta + gypsum. The recorded neutrons are assigned to the individual reactions according to the relative yields compared with standard samples. For a counting time of 15 minutes, the experimental error is 1.5 - 2%. On account of its simplicity, the method is suitable also for investigations in the open air. There are 5 figures and 15 references: 11 Soviet and 2 US.

SUBMITTED: January 21, 1960

Application of the Reaction (α, n) for a S/089/60/009/005/001/020
 Quantitative Determination of the Contents B006/B070
 of Beryllium, Boron, and Fluorine in Dressing Products

investigated. This substance is placed in a casket on a small table. Under the table-top is placed a neutron counter. For the determination of beryllium, use is made of the reaction $\text{Be}^9 + \text{He}^4 \rightarrow \text{C}^{12} + n^1$ which has the highest yield, i.e., 80 neutrons for 10^6 alpha particles of the source. For the determination of fluorine, the reaction used is $\text{F}^{19} + \text{He}^4 \rightarrow \text{Na}^{22} + n^1$ giving a yield of 12 neutrons for 10^6 alpha particles. Boron control utilizes the reactions $\text{B}^{10} + \text{He}^4 \rightarrow \text{N}^{13} + n^1$ and $\text{B}^{11} + \text{He}^4 \rightarrow \text{N}^{14} + n^1$ with a yield of 24 neutrons per 10^6 alphas. The yield from (α, n) reactions on other elements is relatively poor (Al: 0.74 n, Si: 0.16 n, C: 0.11 n, O: 0.07 n). Calibration tests showed that the number of neutrons emitted is directly proportional to the boron, beryllium, and fluorine contents. Fig. 2 shows the calibration curve (neutron pulses per minute versus BeO concentration) for a mixture of BeO, quartz, and feldspar. Fig. 3 shows the calibration curve for a mixture of CaF_2 , quartz, and baryta; and Fig. 4 shows that for

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S/089/60/009/005/001/020
B006/B070

AUTHORS: Plaksin, I. N., Smirnov, V. N., Starchik, L. P.

TITLE: Application of the Reaction (α, n) ¹⁹ for a Quantitative Determination of the Contents of Beryllium, Boron, and Fluorine in Dressing Products

PERIODICAL: Atomnaya energiya, 1960, Vol. 9, No. 5, pp. 361 - 365

TEXT: As a permanent control of concentration during dressing processes is necessary, and since the existing chemical and spectroscopic methods of analysis are slow and complicated, an express method is suggested for the quantitative control of the beryllium, boron, and fluorine contents of ores and dressing products. This method is based on the application of an (α, n) reaction. The alpha source was Po^{210} ($T_{1/2} = 138.3$ days, $E_{\alpha} = 5.3$ Mev, maximum range of the alpha particles in air = 3.8 cm, source intensity = 250 microcuries) applied onto a platinum foil and placed in a simple appliance (Fig.1) and arranged to be over the substance to be

Card 1/3

PLAKSIN, I.N.; ASTAF'YEVA, A.V.; VOSKRESENSKAYA, M.M.; SHABARIN, S.K.

Chlorination as a method to extract platinum and palladium from
oxidized copper-nickel ores. Izv. vys. ucheb. zav.; tsvet. met.
3 no. 6;95-103 '60. (MIRA 14:1)

1. Krasnoyarskiy institut tsvetnykh metallov. Kafedra metallurgii
blagorodnykh metallov. (Chlorination) (Nonferrous metals--Metallurgy)

PLAKSIN, I.M.; SHUKAKIDZE, N.D.

Comparative study of the floatability of stibnite from three deposits depending on the pH of the medium. Izv. vys. ucheb. zav.; tsvet. met. 3 no. 6:42-45 '60. (MIRA 14:1)

1. Krasnoyarskiy institut tsvetnykh metallov. Kafedra metallurgii blagorodnykh metallov. (Antimony)
(Flotation)

SINEL'NIKOVA, A.I.; PLAKSIN, I.N.

Autoclave leaching of gold and silver from products of complex composition. Izv. vysk. ucheb. zav.; tsvet. met. 3 no.5:95-98 (MIRA 13:11)
'60.

1. Krasnoyarskiy institut tsvetnykh metallov. Kafedra metallurgii
blagorodnykh metallov. (Silver--Metallurgy) (Hydrometallurgy)
(Gold--Metallurgy)

TYAN' CHZHUN-CHEN [T'ien Chung-ch'êng]; PLAKSIN, I.N.

Studying the susceptibility to dressing of oxidized finely disseminated tin-bearing ores. Izv. vys. ucheb. zav.; tsvet. met. (MIRA 13:11)
3 no.5:30-36 '60.

1. Krasnoyarskiy institut tsvetnykh metallov. Kafedra metallurgii
blagorodnykh metallov. (Tin ores) (Ore dressing)

SINEL'NIKOVA, A.I.; PLAKSIN, I.N.

Use of the autoclave process for the treatment of gold-bearing concentrates. Izv. vys. ucheb. zav.; tsvet. met. 3 no.4:76-80 '60. (MIRA 13:9)

1. Krasnoyarskiy institut tsvetnykh metallov. Kafedra metallurgii blagorodnykh metallov.
(Gold) (Ore dressing) (Autoclaves)

PLAKSIN, I.N.; LOPATIN, A.G.

Effect of alkalis on the floatability of native gold.
Izv. vys. ucheb. zav.; tsvet. met. 3 no.3:38-44 '60.

(MIRA 14:3)

1. Krasnoyarskiy institut tsvetnykh metallov, Kafedra metallurgii
blagorodnykh metallov.
(Flotation) (Gold)

Gold and silver dissolving in thiocarbamide solutions

S/137/62/000/005/045/150
A006/A101

21.31 mg-cm²/hour. The presence of impurities in the solution (Cu, Pb, Sb compounds) reduces the rate of Au dissolving from 6.92 to 0.85 mg-cm²/hour in the case of Cu; Fe⁺³ accelerates the dissolving process. Au dissolving in thiocarbamide in O₂ atmosphere at a pressure increased to 20 atm, proceeds at the same rate as under conventional conditions. A rise of temperature within 15 - 40°C does not change the dissolving rate. Au extraction from Cu-containing ore was 88.89%, and 95.8% Au are extracted by the described method from Sb containing ore.

G. Svodtseva

[Abstracter's note: Complete translation]

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S/137/62/000/005/045/150
A006/A101

AUTHORS: Plaksin, I. N., Kozhukhova, M. A.

TITLE: Gold and silver dissolving in thiocarbamide solutions

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 5, 1962, 28, abstract 56182
("Sb. nauchn. tr. In-t tsevt. met. im. M. I. Kalinina", 1960, v. 33,
107 - 119)

TEXT: A study was made of the basic physico-chemical conditions of Au dissolving in thiocarbamide, namely: the effect of the concentration of the latter; the rate of pulp mixing; reaction of the medium, oxidizers, impurities contained in the solution, and the temperature of partial O_2 pressure. The rate of Au dissolving was found to be a direct function of the thiocarbamide concentration in the solution; it increases from $0.025 \text{ mg.cm}^2/\text{hr}$ at 0.1% concentration to $3.23 \text{ mg.cm}^2/\text{hour}$ at 9% concentration. Au dissolving is preferably conducted in sulfuric acid medium at 0.1 - 2% H_2SO_4 concentration. H_2O_2 , Na_2O_2 , $FeCl_3$ and $F_2(SO_4)_3$ can be used as oxidizers. At their optimum concentrations as high as 0.03 - 0.06; 0.1; 0.5; 4%, the rate of Au dissolving was respectively 1.9; 1.34; 5.19 and

Card 1/2

PLAKSIN, I.N.; KOROBKIN, A.A.

Studying the effect of certain factors on the sorption of complex chloro acids Pt (IV), Pd (IV), Ir (IV), and Rh (III) by EDE-10P and AN-2F anionites. Sbor. nauch. trud. GINTSVETMET no.33:83-97 '60. (MIRA 15:3)
(Platinum compounds) (Ion exchange)

Theory of the Effect of Flotation Reagent S/150/60/000/000/00-00
on the Flotation of Some Poorly Washable Ores B012/B054

to separate a complex titanium-zirconium ore into single titanium- and zirconium concentrates by means of flotation with the use of aerated collector emulsion. The experiments lead to the assumption that oleic acid changes in its adsorption on the fluorite surface from a cis-isomer to a trans-isomer. Kayyane's investigations also confirm the possibility of a trans-form of unsaturated aliphatic compounds with adsorption on the surface of the mineral particles. In conclusion, it is said that the effect of gases in flotation by means of oxy hydril (oksigidril'nyy) reagents can be regarded as twofold: 1) on the mineral surface; this leads to a change of properties on the surface as dependent on the crystal structure; 2) the effect of gases liberated in water which constitute an important factor and also change the structure of oleic acid. There are 1 table and 12 Soviet references.

ASSOCIATION: Institut gornogo dela AN SSSR (Mining Institute of the AS USSR)

SUBMITTED: March 1, 1960

Card 6/6

Theory of the Effect of Flotation Reagents S/150/60/000/000/001/001
 on the Flotation of Some Poorly Washable Ores B012/B054

liberated in the pulp. On the basis of the investigations made with the use of different methods (not specified here), including a study of the specific effect of gases on the adsorption of the collector (sodium tri-decylate, $C_{12}H_{25}COOH$, which contains the radioactive C^{14}) on fluorite, the author arrived at the conclusion that the gases are a kind of reagent. Oxygen has very distinct activation properties, whereas nitrogen suppresses the flotation of nonsulfide minerals with certain properties of the crystal lattice. The preliminary treatment of the pulp with gases shows the following: Oxygen increases the density and stability of the collector fixation, whereas nitrogen has the reverse effect. Due to crystal structure characteristics, the effect of gases produces reversible changes on the surface of a group of nonsulfide minerals and, in this connection, also reversible flotation properties. In other mineral groups, however, this effect is not reversible. On account of the rules observed, it was possible to develop a procedure for the selective separation of some nonsulfide minerals, and to realize a flotation in which the pulp was treated with the nitrogen of the titanium-zirconium-sand concentrate. Here, a pure smelttable zirconium concentrate was obtained. It was also found possible

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Theory of the Effect of Flotation Reagents 3/100/40/000/000/000/000
 on the Flotation of Some Poorly Washable Ores B012/B054

interaction of minerals and reagents. The conditions prevailing in the flotation of pyrrhotite and sphalerite confirm this effect. Thorough investigations carried out at the IGD AS USSR and other institutes concerning the floatability of zincblendes showed that not all zincblendes float in the same way. The iron content of the zincblende influences the flotation of the mineral. The more iron, the worse floats the mineral. The experiments showed that a joint use of xanthogenate and a mixture of high-boiling phenols (40%), fatty acids (25-30%), and neutral hydrocarbons, or of alkyl-aryl sulfonate, increased the mineral yields. 95-96% of the sulfides were transferred into the foam (without activation by the salts of heavy metals). This was confirmed by experiments carried out on a pyrrhotite ore by R. K. Alekseyeva, Engineer. The studies made here concerning the flotation behavior of flucrite, barite, titanium, and zirconium showed that the flotation of these minerals is greatly determined by the molecular-physical properties of the mineral surface, and characterized by the position of ions in the boundary layer, the noncompensated electrostatic charges, and the evenness of their distribution at the boundaries of the unit cell. This is, however, directly connected with the varying degree of hydration surface, and the behavior of the gases

Card 4/6

Theory of the Effect of Flotation Reagents 3/130/60/000/008/001/001
on the Flotation of Some Poorly Washable Ores B012/B054

separation (by flotation) of hübnerite and wolframite from quartz, calcite, and fluorite in the range of from 1.2 to 2.3 pH with the use of aliphatic amines was the efficient absorption of the amine ions by hübnerite and wolframite, as well as a minor absorption of the same quartz, calcite, and fluorite in the pH range mentioned. Next, the author describes the investigation of the flotation of oxidized molybdenum minerals which showed that the use of sodium oleate combined with some substances of lower surface tension gives much higher yields. Adsorption and flotation experiments with radioactive isotopes were carried out to find the cause of the higher efficiency of the collector. Sodium tridecylate (C^{14}) was used as collector. The experiments showed that the flotation activity of sodium tridecylate also increased on the mineral surface with an increase in dispersity of its aqueous solution, first with the addition of petroleum and soda, then even more - with the introduction of sodium alkyl sulfate. On the basis of the investigations, it was found that sodium alkyl sulfate is a dispersing agent for fatty-acid soaps, and a new reagent procedure was developed and introduced in the Balkhashskaya molybdenovaya fabrika (Balkhash Molybdenum Factory). Next, the author describes the investigations of the effect of composition, structure, and chemical bonding character on the

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Theory of the Effect of Flotation Reagents on the Flotation of Some Poorly Washable Ores 6/150/60/500/500/500/500
BO12/BO14

ments showed that among the chemically pure aliphatic amines the primary amines exhibited the distinctest collecting qualities with respect to minerals containing tungsten. Industrial amines (primary amines with addition of secondary and tertiary amines) have even better collecting qualities. The reagent MM 11 (IM-11) proved to be the best one. Tridecyl amine tagged with C¹⁴ was used to determine the absorption of amines by hübnerite, wolframite, and accompanying minerals. It was found that a single-layer fixation of tridecylamine acetate occurred on the hübnerite surface at concentrations of up to about 32 mg/l (corresponding to a dosage of 200 g/ton), and a multi-layer fixation at higher concentrations. The author examined the stability of the fixation of cationic collectors on the surface of the minerals investigated on the strength of the desorption of tridecylamine from the mineral surface. The experiments showed that the cationic collectors were fixed with relatively high stability on the hübnerite- and wolframite surface but with much lower stability on the quartz-, calcite-, and fluorite surface. With the aid of the microautoradiographic procedure developed at the IGD AS, it was found that tridecylamine was unevenly distributed over the hübnerite- and wolframite surface. The investigations showed that the main reason for the good

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E/150/60/000/000/001
B012/B054

AUTHOR: Plaksin, I. N., Corresponding Member of the USSR
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TITLE: Theory of the Effect of Flotation Reagents on the Flotation
of Some Poorly Washable Ores
PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy. Gornyy zhurnal,
1960, No. 8, pp. 139-146

TEXT: V. I. Tyurnikova, Candidate of Technical Sciences, G. N. Khazhinskaya, Candidate of Technical Sciences, G. A. Myasnikova, Candidate of Technical Sciences, and Ye. M. Chaplygina, Candidate of Technical Sciences assisted in the present investigation of the possibility of using aliphatic amines of different structures, single and multicomponent collector mixtures, collectors with frothing qualities, the effect of gases as well as the influence of composition, structure, and character of the chemical bond on the interaction between reagents and minerals. Cationic collectors were used for the flotation of hubnerite and wolframite. Several types of aliphatic amines synthesized at the Mekhanobr, the Gintsvetmet, and the Nauchno-issledovatel'skiy institut zhirov (Scientific Research Institute of Fats), were tested. The experi-
Card 1/6

SOLNYSHKIN, V.I., kand.khimicheskikh nauk; PLAKSIN, I.N.;
KLASSEN, V.I., doktor tekhn.nauk

Heat of wetting of coal by aqueous solutions of flotation
reagents. Nauch.soob.Inst.gor.dela 6:117-128 '60. (MIRA 15:1)

1. Chlen-korrespondent AN SSSR (for Plaksin).
(Coal preparation)

PLAKSIN, I.N.; SOLNYSHKIN, V.I., kand.khimicheskikh nauk

Study of some flotation reagents by infrared spectroscopy. Trudy
Inst.gor.dela 6:21-29 '60. (MIRA 14:4)

1. Chlen-korrespondent AN SSSR (for Plaksin).
(Flotation—Equipment and supplies) (Spectrum, Infrared)

PLAKSIN, I.N.; ZAYTSEVA, S.P., kand.tekhn.nauk

Relation between the simultaneous action of several collectors and
their distribution among the particles of galena in flotation pulp.
Trudy Inst.gor.dela 6:15-20 '60. (MIRA 14:4)

1. Chlen-korrespondent AN SSSR (for Plaksin).
(Galena) (Flotation--Equipment and supplies)

PIAKSTIN, I.N.

Orig. drawing plants in the Polish People's Republic. (PRA 1: 1)
n. h. k. z. n. v. i. s. v. e. t. n. e. t. 3. n. e. t. (B-71) 140. (PRA 1: 1)
(Poland - Orig. drawing)

PLAKSIN, I.N.; KHAZHINSKAYA, G.N., kand.tekhn.nauk

Radiometric analysis in studying the flotation process. Trudy
Inst.gor.dela 6:8-14 '60. (MIRA 14:4)

1. Chlen-korrespondent AN SSSR (for Plaksin).
(Radioisotopes—Industrial applications) (Flotation)

ZAYTSEVA, S.P.(Moskva); PLAKSIN, I.N.(Moskva)

Combined action of certain sulfhydryl collector-reagents in
the flotation of galenite. Izv. AN SSSR. Otd.tekh.nauk. Met.
i topl. no.5:195-199 S-0 '60. (MIRA 13:11)
(Flotation--Equipment and supplies) (Lead ores)

VLASOVA, N.S.; KLASSEN, V.I.; PLAKSIN, I.N.

Possibility of using emulsifying agents in the flotation of coal
slimes. Koks i khim. no.4:10-12 '60. (MIRA 13:7)

1. Institut gornogo dela 'AN SSSR.
(Coal preparation)
(Flotation)
(Emulsifying agents)

S/180/60/000/02/018/028
E1111/E152

Use of Radioactive and Nuclear Radiations in the
Investigation of the Flotation Process

no appreciable effect and the fast neutrons emitted are not absorbed in the material. This procedure is simpler and safer than previously proposed (Refs 32, 33) methods. For aluminium-containing ores the authors propose the transmutation of Al^{27} into P^{30} by alpha particles from Po^{210} , the decay of the phosphorus giving high-energy positrons. This method, with suitable working curves, enables 0-100% Al_2O_3 to be determined sufficiently accurately without interference from other elements, and requires a sample of 1 g or less. There are 12 figures and 42 references, of which 30 are Soviet, 11 English and 1 is German.

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SUBMITTED: December 4, 1959

S/180/60/000/02/018/028

E111/E152

Use of Radioactive Isotopes and Nuclear Radiations in the
Investigation of the Flotation Process

adhesion was strong on huebnerite and wolframite and less so on quartz, calcite and fluorite (Fig 11 gives absorption as functions of water volume). Microradiograms (Fig 12) show that tridecylamine is unevenly distributed on the huebnerite-particle surface. The authors give some examples of radioactive isotope applications. Plaksin and M.A. Goldin have proposed a pulp-density test device based on radioactive caesium. A special launder proposed by the authors has given good results in prolonged tests at the Yuzhnyy gornoobogatitel'nyy kombinat (Southern Mining Beneficiation Combine). Quantitative analysis of ore dressing products could be obtained by bombardment with alpha particles to cause neutron emission. This has been applied to fluorite ores, with a special installation for bombardment (from Po^{210} on platinum foil) in which the powder enclosed in a container was placed on a table on a type SCh-3 neutron counter with the source above it. Working curves for the test elements are previously prepared. Particle size has

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Use of Radioactive Isotopes and Nuclear Radiations in the
Investigation of the Flotation Process

action of chromates on these minerals is due to the formation on the mineral surface of very insoluble medium or basic chromates which prevent adhesion of particles to bubbles. Marked tridecylamine has been used to investigate the reaction of a cationic collecting agent with minerals. Fig 10 shows the adsorption of the reagent from aqueous solution of its acetates on huebnerite, quartz, fluorite and calcite (curves 1, 2, 3 and 4, respectively). Recoveries of huebnerite and quartzite were compared with tridecylamine absorption by them for pH of 1.5-10.0. Flotation experiments were also carried out with mixtures of minerals using marked tridecylamine (100 g/ton) at pH = 1.5. Complete separation into two products was possible, with 41-67% of the reagent absorbed by the froth product and only 1-4% by the non-froth. Experiments were made on the firmness of adhesion of cationic collecting agents on non-sulphide mineral surfaces in which 1-150 ml volumes of distilled water were used to wash tridecylamine from mineral powders:

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E111/E152

Use of Radioactive Isotopes and Nuclear Radiations in the
Investigation of the Flotation Process

detergent (mainly consisting of alkylaryl sulphonates); as the detergent feed rises more and more pyrrhotine grains have nonuniform xanthate distribution (Figs 7a and 7b give microradiographs for froth product particles for 200 and 1800 g of detergent per ton, respectively). Work with marked xanthate has shown that chromates do not displace that reagent from sulphide-mineral surfaces (Refs 26, 27) and, using Cr⁵¹ the depressing action of chromate has been studied in relation to the amount added and the pH of the solution. Fig 8 shows dichromate adsorption by galenite as a function of pH; in Fig 9 the adsorption of chromate (A) and the recovery of froth fractions of galenite (curves 1, 4) and pyrite are shown as functions of potassium dichromate added (g/ton). Under acid conditions the Freundlich isotherm is followed in Fig 8; an alkaline solution adsorption stays virtually constant. In Fig 9 maximum adsorption for both minerals corresponds to minimum flotation recovery and conversely. The authors conclude that the depressive

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Investigation of the Flotation Process

froth product (Fig 4). Using the microradiographic method the nonuniformity of various flotation-reagent absorptions by various minerals has been studied (Refs 10-14). With the aid of a special apparatus designed at the Institute by S.V. Bessonov (Ref 16), the influence of oxygen-content on flotation was investigated: some oxygen was found to be essential for flotation, the uniformity of reagent distribution on the froth-product particle surface rising with increasing oxygen concentration. The attachment of ethyl xanthate on some minerals, denied by some non-Soviet workers, was demonstrated using radioactive isotopes (Refs 23, 37 and 40). Investigation of these minerals (zinc blende and pyrrhotine) enabled the influence of their crystal-lattice defects on flotation to be shown. Fig 5a shows the effect of grams of pine oil per ton of mineral on recovery of pyrrhotine, and Fig 5b shows the corresponding effect on the absorption of various xanthates on the mineral. Fig 6 gives corresponding curves for addition of type DS

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E111/E152

Use of Radioactive Isotopes and Nuclear Radiations in the
Investigation of the Flotation Process

photographic emulsion; "wet" microradiography, based on the physical adsorption and maturing of silver crystals on active centres in emulsion in a silver-ion containing solution (developed by Gomberg for biological and metallographic use). Experiments with S^{35} -containing mercapto reagents showed that under normal conditions there was no direct and unique relation between the average density of the collecting-agent layer on the mineral and its flotability (Fig 1). Automicroradiography gave the first experimental proof of the unevenness of the coverage of particle by collecting agent (Fig 2); this work was supplemented by measurements of the electric properties of sulphide-mineral surfaces. The donor and acceptor regions were revealed (Fig 3) by polarization in a solution of $CuSO_4$ (or $AgNO_3$) and of KI (or $K_3[Fe(CN)_6]$), respectively. Microautoradiographic studies showed that reagent-distribution is uneven from particle to particle: only those particles which are slightly or not covered with reagent do not appear in the

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S/180/60/000/02/018/028

E111/E152

AUTHORS: Zaytseva, S.P., Myasnikova, G.A., Plaksin, I.N.,
Starchik, L.P., Tyurnikova, V.I., Khazhinskaya, G.N.,
and Shafeyev, R.Sh. (Moscow)

TITLE: Use of Radioactive Isotopes¹⁵ and Nuclear Radiations in
the Investigation of the Flotation Process

PERIODICAL: Izvestiya Akademii nauk SSSR. Otdeleniye tekhnicheskikh
nauk. Metallurgiya i toplivo, 1960, Nr 2, pp 120-132 (USSR)

ABSTRACT: This paper, which includes a survey, was presented by Plaksin at the general meeting of the Otdeleniye tekhnicheskikh nauk (Technical Sciences Division) AN SSSR (Academy of Sciences, USSR) on 27th October 1959. It points out that radioactive methods are particularly suitable for flotation research, where they have been applied by various Soviet research organisations including the Institut gornogo dela (Mining Practice Institute) AN SSSR (Acad. Sci. USSR) (Refs 1 and 2). The methods developed there are: contact microradiography, in which pulp particles are fixed on a cover glass which is then placed on photographic film; trace microradiography, in which the particles are immersed directly in

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The use of Po^{210} alpha radiation ...

9/137/61/000/010/055/056
A006/A101

activation analysis was employed for the quantitative control of products containing Al and B. Po^{210} with 120 mcurie activity was employed as a radiation source. The radioactivity induced was measured with an end-window counter of device B. The content is calculated from gradation graphs, plotted for standard mixtures. The separate determination of B and Al is obtained on account of the difference in their maximum radiation energies and the half life periods. The accuracy of determination is 2 - 3%. There are 9 references. ✓

Yu. Bykovskaya

[Abstracter's note: Complete translation]

Card 2/2

S/137/61/000/010/055/056
A006/A101

AUTHORS: Flaksin, I.N., Smirnov, V.N., Scharshik, M.P.

TITLE: The use of Po^{210} alpha radiation for the quantitative control of concentration products containing beryllium, boron, fluorine and aluminum

PERIODICAL: Referativnyy zhurnal. Metallurgiya, no. 10, 1961, 8, abstract 10K45 ("Tr. Tashkents. konferentsii po mirn. ispol'zovaniyu atomn. energii v. 2", Tashkent, AN AzSSR, 1960, 193 - 299)

TEXT: The authors discuss 2 methods of analysis with the aid of $Po^{210} \alpha$ - radiation, namely, analysis using radiation emitted as a result of the reaction of capturing nuclear particles by reaction (α, n) and activation analysis. To determine Be, B, F in concentration products, the following nuclear reactions are employed: $Be_4 + He_2 \rightarrow C_6^{12} + n'_0$; $F_9 + He_2 \rightarrow Na_{11}^{22} + n'_0$ and $B_5 + He_2 \rightarrow N_7^{14} + n'_0$. The amount of n is proportional to the Be, F and B content. To carry out an analysis of powdery products a special device was developed. A detailed layout of the device is presented. The Be, B and F content is determined from graduation graphs or by a corresponding calculation formula. The radio-

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S/024/60/000/01/027/028

E194/E355

General Meeting of the Technical-science Division of the
Ac.Sc., USSR (October, 1959)

particles of minerals, the influence of various gases on flotation and a number of other important problems. The following participated in the discussion: V.A. Glembofskiy, V.I. Klassen, S.I. Pol'kin, K.I. Barysheva, G.A. Myasnikova, Ye.M. Chaplygina and R.M. Shafeyev. The general meeting of the Technical-science Division noted that in the last seven years the laboratory of radioactive isotopes of the Mining Institute of the Ac.Sc. USSR and other scientific institutions have done much to develop these new methods of investigating flotation processes and other processes for enriching ores. The new methods make it possible to investigate the relationships between the flotation technique and the density in distribution of the layer of reagents on the surfaces of mineral particles. New data are obtained on the flotation of minerals in relation to the amount of adsorbed reagent and its distribution. The use of gamma-radiation aided the development of automatic control of pulp density,

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General Meeting of the Technical-science Division of the
Ac.Sc. USSR (October, 1959)

suited to the particular conditions. Investigations of the interaction of reagents with minerals were made with radioactive isotopes and disclosed the influence of the density of the absorbing layer on the flotation process. The author demonstrated a number of important results obtained by microradiography. In particular, it was shown experimentally that the sorbent is not uniformly covered with particles of mineral, whilst individual particles of sorbent may be covered by a number of layers. The microradiography methods developed in the Institute permit of quantitative evaluation of the degree of non-uniformity of absorption of flotation reagents by minerals. Radioactive isotopes were also used effectively in measuring the action of oxygen in the process of flotation. Other examples and illustrations related to the successful use of radioactive isotopes, radiometry and microradiographic analysis to study the interaction between reagents and minerals, the distribution of reagents both between the products of flotation and on the surface of individual

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✓

S/024/60/000/01/027/028
E194/E355

AUTHOR: None given

TITLE: General Meeting of the Technical-science Division of the Ac.Sc., USSR (October, 1959)

PERIODICAL: Izvestiya Akademii nauk SSSR, Otdeleniye tekhnicheskikh nauk, Energetika i avtomatika, 1960, Nr 1, pp 173-176 (USSR)

ABSTRACT: A general meeting of the Technical-science Division of the Ac.Sc., USSR was held on October 27, 1959, under the presidency of Academician A.A. Blagonravov. Two reports were read on:

- 1) the application of radioactive isotopes and atomic radiation to the examination of flotation processes, by Corresponding Member of the Ac.Sc. USSR I.N. Plaksin;
- 2) specialised digital-analogue computers for programme control of a cutting tool, by Doctor of Technical Sciences A.A. Voronov.

I.N. Plaksin described how the laboratory for the concentration of ores of rare elements in the Institut gornogo dela (Mining Institute) of the Ac.Sc. USSR (of which he is in charge) had studied the flotation process by using reagents containing radioactive tracers carbon 14, sulphur 35, calcium 45, phosphorus 32 and chromium 51. The laboratory selects a microradiographic analytical procedure.

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Investigation of Adsorption Layers of
Xanthogenate on Gold by Means of
Radioactive Isotopes

77726

2077-105-01-1-1-17

the desorption is complete. The authors conclude that in the regular concentrations (ions than 10^{-4} g/l) for flotation, xanthogenate forms films which closely approach the stoichiometric ionic ratio of X_2^{2-} and the metal. This layer is most stable on the metal surface. A further growth of layers in thickness is not necessary for flotation as the upper layers are less stable and do not enhance water-repellent properties. There are 3 tables; 4 figures; and 3 references, 1 Soviet, 1 U.S., 1 U.K. The U.S. and U.K. references are: J. Leja, Prepared for the Proceedings of Second International Congress of Surface Activity, London, Butterworths Scientific Publications, 1960-62 (1960); A. M. Gaudin, Schumann, J. Phys. Chem., 40, 107 (1936). Krasnoyarsk Institute of Nonferrous Metals. Chair of Metallurgy of Noble Metals (Krasnoyarsk Institute of tsvetnykh metallov. Kafedra metallurgii bluzhnykh metallov).

ASSOCIATION:

SUBMITTED:
Card 4/4

October 23, 1959

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SC/159-1-1-201

Card 3/4

Investigation of Adsorption Layers of
Xanthogenate on Gold by Means of
Radioactive Isotopes

7/7/76

397/149-10-1-3/87

through the xanthogenate film. The rate of diffusion decreases with the thickening of the film. While only a very thin layer consists of gold xanthogenate, subsequent layers become poorer in gold ions and finally xanthogenate alone is deposited due to weak dispersion forces of molecular interaction. Film formation is influenced by the following factors: Maximum adsorption is observed in a neutral medium with $\text{pH} \approx 7$. The same was observed by M. D. Ivanovskiy in connection with xanthogenate sorption on platinum. A simultaneous reaction of gold with xanthogenate and cyanide causes the formation of a xanthogenate film despite the dissolving action of cyanide both on gold and gold xanthogenate. The influence of sodium sulfide is entirely different. Being the strongest depressing agent, it prevents the formation of a xanthogenate film, which may be due to active S^{2-} ions with the metal surface and the formation of AuS and Au_2S_3 precipitates. These facts are confirmed by the desorption of xanthogenate films by NaCN and Na_2S . While the action of the former is

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77716
204/14 7-15-17-1007

AUTHORS:

Lopatin, A. G., Plaksin, I. E.

TITLE:

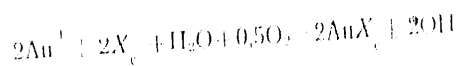
Investigation of Adsorption Layers of Xanthogenates on Gold by Means of Radioactive Isotopes

PERIODICAL:

Izvestiya vysshikh uchebnykh zavedeniy. Tsvetnaya metallurgiya, 1960, Nr 1, pp 35-42 (USSR)

ABSTRACT:

Isoamyl xanthogenates tagged with S^{35} and desorbent reagents were used to determine their reaction with a porous gold powder, mesh -0.4, 40.7 mm. The fixation of xanthogenate on gold is assumed to be the result of reaction:



However, this reaction applies only to thin layers in presence of free areas of metallic gold. The nature of subsequent layers depends on the diffusion of gold ions

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instruments used, such as automatic regulators, flowmeters, level gauges, and high-sensitivity photo-relays, are described. No personalities are mentioned. References follow individual articles.

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RADIOACTIVE ISOTOPES AND NUCLEAR RADIATION
IN ENGINEERING AND GEOLOGY

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Baksar, I. M., and V. A. Yanushkovskiy [Institut fiziki AN Latv. SSR - Institute of Physics AS Latvian SSR]. Problems of the Simplification of Automatic-Control Apparatus Based on the Use of Radioactive Isotopes 9

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Transactions of the Tashkent (Cont.)

257/5416

Candidate of Physics and Mathematics; Yu. M. Tashkulyov, Doctor of Biological Sciences. Ed.: R. I. Khaidov; Tech. Ed.: A. G. Babakhanova.

PURPOSE: The publication is intended for scientific workers and specialists employed in enterprises where radioactive isotopes and nuclear radiation are used for research in chemical, geological, and technological fields.

CONTENTS: This collection of 133 articles represents the second volume of the Transactions of the Tashkent Conference on the Peaceful Uses of Atomic Energy. The individual articles deal with a wide range of problems in the field of nuclear radiation, including: production and chemical analysis of radioactive isotopes; investigation of the kinetics of chemical reactions by means of isotopes; application of spectral analysis for the manufacturing of radioactive preparations; radioactive methods for determining the content of elements in the rocks and in analysis of methods for obtaining pure substances. Certain

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Tashkentskaya konferentsiya po shtroemu ispol'zovaniyu atomnoy energii, Tashkent, 1959.

Trudy (Transactions of the Tashkent Conference on the Peaceful
Uses of Atomic Energy) v. 2. Tashkent, Izdat. AN UZSSR, 1960.
449 p. Mirata slip inserted. 1,500 copies printed.

Sponsoring Agency: Akademiya nauk Uzbekskoy SSR.

Responsible Ed.: S. V. Starodubskiy, Academician, Academy of Sciences Uzbek SSR; Editorial Board: A. A. Solov'yev, Candidate of Physics and Mathematics; D. M. Akhmedov, Doctor of Medical Sciences; G. A. Amliyev, Academician, Academy of Sciences Uzbek SSR; A. A. Erokhovskiy, Candidate of Biological Sciences; V. N. Trushev; G. B. Eshonov; A. V. Elov, M.D.; I. I. Ismagulov, Candidate of Physics and Mathematics; A. I. Akhmedov, Candidate of Medical Sciences; D. M. Farov, Candidate of Medical Sciences; A. S. Sadykov, Corresponding Member, Academy of Sciences USSR, Academician, Academy of Sciences Uzbek SSR; Yu. M. Zaitsev,

Case 1/20

PLAKSIN, I.N., red.; KLASSEN, V.I., prof., doktor tekhn.nauk, red.;
PODKOSOV, L.G., kand.tekhn.nauk, otv.red.; TSUKERMAN, S.Ya.,
red.izd-va; KONDRAT'YEVA, M., tekhn.red.

[Theory of gravity methods of mineral ore dressing; transactions]
Voprosy teorii gravitatsionnykh metodov obogashcheniya poleznykh
iskopaemykh; trudy. Pod red. I.N.Plaksina i V.I.Klassena. Moskva,
Gos.nauchno-tekhn.izd-vo lit-ry po gornomu delu, 1960. 258 p.

(MIRA 14:1)

1. Vsesoyuznoye soveshchaniye po voprosam teorii gravitatsionnykh
metodov obogashcheniya poleznykh iskopayemykh. 1958. 2. Chlen-
korrespondent AN SSSR (for Plaksin). 3. Institut gornogo dela
AN SSSR (for Plaksin, Klassen). 4. Vsesoyuznyy institut mineral'nogo
syr'ya (for Podkosov).

(Ore dressing)

PLAKSIN, Igor' Nikolayevich; OKOLOVICH, Anna Mikhaylovna; NAZAROVA,
Galina Nikitichna; SUVOROVSKAYA, N.A., otv.red.; GADZHINSKAYA,
M.A., red.izd-va; BERESLAVSKAYA, L.Sh., tekhn.red.

[Use of certain alkylarylsulfonates as frothers in the flotation
of nonferrous ores] Primenenie nekotorykh alkilarilsul'fonatov
v kachestve penoobrazovatelei pri flotatsii rud tsvetnykh metallov.
Moskva, Gos.nauchno-tekhn.izd-vo lit-ry po gornomu delu, 1960.
103 p.

(MIRA 14:3)

(Flotation--Equipment and supplies)
(Nonferrous metals)

VLASOVA, Nina Sergeyevna; KLASSEN, Villi Ivanovich; PLAKSIN, Igor' Nikolayevich; KHODAKOV, I.K., red. izd-va; BERESLAVSKAYA, L.Sh., tekhn. red.

[Principles of selecting reagents for flotation of difficult-to-dress coal fines] O printsipakh podbora reagentov dlia flotatsionnogo obogashcheniia melochi trudnoobogatimyykh uglei. Moskva, Gos. nauchno-tekhn. izd-vo lit-ry po gornomu delu, 1960. 33 p. (MIRA 14:7)
(Flotation) (Coal)

ILANOTI, I. I.

"Basic Trends in the Present Day Notions of Coal Beneficiation."

report presented at the Conference on Beneficiation of Coal, organized
by the Learned Council of the ICP, 48 "Dok, Balakhesh/Karabags, 29 Nov - 1 Dec 1961.

PLAKSIN, I. N., ZETSEVA, S. P., KHAZHINSKAYA, G. N., SHAPYREV, R. S. (USSR)

"The Use of Radioisotopes for the Study and Control of Flotation Processes."

report presented at the ~~XXXXX~~ Conference on Radioisotopes in Metallurgy and Solid State Physics, IAEA, Copenhagen, 6-17 Sept. 1960.

PLAKSIN, I.N.

"Study of Superficial Layers of Flotation Reagents on Minerals and
the Influence of the Structure of Minerals on their Interaction
with Reagents."

report to be presented at the Intl. Mineral Processing Congress, London, England, 6-9 Apr 60.
Head, Section of Mineral Dressing, Institute of Mining, USSR Academy of Sciences.

66426

The Use of Artificial Radioactivity Induced by α -Particles for the Quantitative Control of Products Containing Aluminum and Boron SOV/20-128-6-31/63

be used for the analysis. The method suggested facilitates a rapid determination and a technologically acceptable accuracy of determination of boron and aluminum in abundant ores, products of dressing, and alloys. Ye. G. Prozhoga cooperated in the paper. There are 2 figures and 1 reference.

SUBMITTED: July 3, 1959

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65426

The Use of Artificial Radioactivity Induced by α -Particles for the Quantitative Control of Products Containing Aluminum and Boron SOV/20-128-6-31/63

counting the positron-electron radioactivity induced in the hydroboracite, the total radiation of N^{13} and Al^{28} is recorded. The activity of Al^{28} is considerably smaller than that of N^{13} since the Mg-quantity in the hydroboracite is small, and the yield of the nuclear reaction (α, p) is also small. The radiation of Al^{28} does not distort the proportionality between the value of the induced activity and the hydroboracite content in the product controlled since Mg is a component of the hydroboracite lattice. The calibration diagram (Fig 2) shows that the method described makes it possible to determine the aluminum oxide in the range of 1 - 100%. Other radioactive elements resulting from the nuclear reactions either have a long, or a very short, half life, and give no noticeable activity in the B- and Al-analysis. If the thickness of layer of the product controlled exceeds 20 μ , its amount of weight is unimportant to the amount of induced radioactivity. Thus, also small quantities of 1 g and less may

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The Use of Artificial Radioactivity Induced by α -Particles for the Quantitative Control of Products Containing Aluminum and Boron SOV/20-128-6-31/63

with a higher maximum energy of 3.6 Mev. The products containing B and Al were irradiated for 10 minutes. Within this period, the P^{30} -quantity increased up to 0.94 of the maximum value, while the activity of N^{13} simultaneously increased up to 0.5 of this value. The minimum distance of the radiation source from the product controlled (0.5 mm) reduces the losses of α -particles in the air. After this irradiation, the products were checked with the help of an end-window counter. The time interval between the activation irradiation and the beginning of counting must be a minimum and constant. The radioactivity induced is recorded by a unit of type B-2. For determining the boron- and aluminum contents, calibration diagrams are drawn on the basis of standard mixtures with a known Al- and B-content. Figure 1 shows such a diagram for hydroboracite ($CaO \cdot MgO \cdot 3B_2O_3 \cdot 6H_2O$). By irradiation of Mg^{25} , a radioactive isotope Al^{28} is formed by the nuclear reaction (α, p); this isotope radiates electrons with a maximum energy of 3.0 Mev and a half life of 2.3 minutes. In

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~~5 (2), 21 (8)~~ 5.5500 66426

AUTHORS: Plaksin, I. N., Corresponding Member SOV/20-128-6-31/63
 AS USSR, Smirnov, V. N., Starchik, L. P.

TITLE: The Use of Artificial Radioactivity Induced by α -Particles for the Quantitative Control of Products Containing Aluminum and Boron

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 128, Nr 6, pp 1208 - 1209 (USSR)

ABSTRACT: The radioactivity mentioned in the title has been previously (Ref 1) used for the analysis of biological tissues. The authors suggest a rapid method of analyzing powder samples for the control of working processes of ores containing aluminum and boron. Po-210 is used as an α -radiator. On irradiating boron B¹⁰ with α -particles, the radioactive nitrogen-isotope N¹³ is formed by a nuclear reaction (α, n). By decomposition of N¹³ ($T^{1/2} = 10.1$ min), positrons are formed with a maximum energy of 1.24 Mev. Al²⁷ yields, under the same conditions, radioactive phosphorus P³⁰. By decomposition of P³⁰ ($T^{1/2} = 2.5$ min), positrons are formed

Card 1/4

On the Problem of the Quantitative Estimation of the Xanthate Stay in Dependence on the Surface Properties of Sulfide Minerals SOV/20-128-4-32/65

particles in the pulp when they collide. There are 3 figures and 8 references, 6 of which are Soviet.

SUBMITTED: June 19, 1959

Card 4/4

On the Problem of the Quantitative Estimation of the SOV/20-128-4-39/65
Xanthate Stay in Dependence on the Surface Properties
of Sulfide Minerals

hole-conductivity. Figure 2 shows a scheme of the formation of an electrochemical spot on the galenite surface in consequence of the change of the stoichiometric composition of the mineral. The electrochemical processes on the surface of the minerals are very complicated and extensive. A formation of dioxanthogenide in the xanthate flotation of the sulfide minerals (especially of the copper-bearing ones) occurred several times. The formation of dioxanthogenide on the anode in the electrolysis is known as well (Ref 8). The authors confirmed this in the electrolysis of 10 ml of the 0.01 n-xanthate solutions. The electrochemical factor is very important in the interaction between sulfide minerals and xanthates. Therefrom follows the part played by the inner electrolysis which results from the contact in the collision of the sulfide mineral particles with different electrochemical potentials. By this electrochemical system xanthate can be additionally oxidized into dioxanthogenide. The dioxanthogenide formed on the particle surface may shift to more hydrophobe spots of the mineral surface as well as to other

Card 3/4

On the Problem of the Quantitative Estimation of the Xanthate Stay in Dependence on the Surface Properties of Sulfide Minerals SOV/20-26-4-33/68

face sections of galenite amounts to approximately 400-500 mV. This agrees with the measured values of the electrochemical potential of different galenite samples. Figure 1 shows the topography of the potential distribution on the galenite surface determined by the method described in CuSO_4 at a voltage change within 1 minute. Furthermore, it was found that various impurities and fine mud particles clinging to the facets of the sulfide minerals contribute towards the inequipotentiality of the sulfide surface. A local micro-galvanic element exists here. The specificity of the sulfide minerals as typical semiconductor must not be neglected. The main impurities in natural galenite are lead- or sulphur atoms, the latter in excess. The following formula of the sulfides is therefore more correct: $\text{Me}_{1-x}\text{S}_x$, x denoting the sulphur content in the sulfide, expressed in fractions of one. x amounts for PbS in a stoichiometric composition to 0.145. If the lead atoms are in excess, galenite tends towards an electron conductivity, if sulphur atoms are in excess, galenite has the tendency to have a

5 (1).

AUTHORS: Flaksis, I. N., Corresponding Member SCV, 20-128-1-30/68
AS USSR, Shafeyev, R. Sh.

TITLE: On the Problem of the Quantitative Estimation of the Xanthate
Stay in Dependence on the Surface Properties of Sulfide
Minerals

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 128, Nr 4, pp 777 - 780
(USSR)

ABSTRACT: The spot-like distribution of the flotation reagents on the
surface of mineral particles of the flotation pulp is partly
caused by the electrochemical heterogeneity (Refs 1-3). In the
present paper the authors give some experimental results there-
to. They measured the gradient of the electric fields between
the surface sections of the sulfides which had different elec-
trochemical potentials. For this purpose the authors used the
cathodic polarization of the minerals in 0.01 n copper sulfate
or silver nitrate solution (method see Ref 4). For this pur-
pose the separation boundaries of the cathode metal were de-
termined at a periodic change of the polarization change in
the negative direction. It was proved by many experiments that
the gradient of the electric fields between the individual sur-

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SOV/20-127-3-40/71

Quantitative Control of the Products Obtained in Dressing Beryllium and
Fluorite Ores by α -Bombardment

This error, however, does not exceed 1 - 2% of the concentration
to be determined. The time-consuming and sufficiently precise
method mentioned above can also be applied to boron. There
are 2 figures and 2 references, 1 of which is Soviet.

SUBMITTED: May 15, 1959

Card 3/3

SOV/20-127-3-40/71

Quantitative Control of the Products Obtained in Dressing Beryllium and
Fluorite Ores by α -Bombardment

138.3 days and is very suitable for these purposes because only slight γ -radiation occurs in its decay. This isotope was applied to a platinum foil by vacuum sublimation. The dressing product was filled into a box for the purpose of determining the beryllium- and fluorite content. The neutrons were counted by means of an SCh-3 counter. Graduation diagrams were then plotted according to standard mixtures (Fig 1). The latter showed that the number of neutrons struck out by α -particles was in direct proportion to the beryllium content. Figure 2 shows such a diagram for the mixture fluorite - quartz - barite. Since the fluorite content of the initial ore is sufficiently high its content can also be determined in this case. The grain size of the products to be controlled is irrelevant as to the neutrons struck out. The resultant neutrons are fast on the whole so that they are practically not absorbed by the layer of the product. For the same reason the material and the thickness of the box walls are irrelevant in neutron-counting. Analysis of wet products is complicated by a film formed on the particle surface by condensed water.

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5(1, 2), 21(7)

SOV/20-127-3-40/71

AUTHORS: Plaksin, I. N., Corresponding Member, AS USSR, Smirnov, V.N.,
Starchik, L. P.

TITLE: Quantitative Control of the Products Obtained in Dressing
Beryllium and Fluorite Ores by α -Bombardment

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 127, Nr 3, pp 618-619
(USSR)

ABSTRACT: Photonuclear reaction (γ, n) had been used already earlier
(Ref 1) for the quantitative determination of beryllium
in ores. In connection herewith, neutrons were formed due
to the effect of rigid γ -rays. The authors used the nuclear
reaction (I) for controlling the concentrates (as mentioned
in the title) of beryllium ores; reaction (II) was used for
fluorite ores. In both cases, neutrons were struck out by
 α -particles. Beryllium showed the largest yield of the
nuclear reaction (α, n) as compared with other elements. Other
elements occurring in the afore-mentioned ores in addition
to beryllium and fluorite showed a considerably lower neutron
yield. Thus, the number of neutrons, struck out of the above
dressing products by α -particles is proportional to the
beryllium and fluorite content. The polonium isotope Po-210
was used as a source of α -radiation. It has a half-life of

Card 1/3

Effect of Iodine on the Floatability of Sulfide Minerals SOV/20-127-2-41/70

The following course is assumed: iodine adheres on the mineral surface, it oxidizes xanthogenate to produce dixanthogenide, and this in turn adheres on the sulfide minerals. Iodine acts as collector. Slight iodine additions are sufficient to intensify the floatability of sulfide minerals. There are 3 tables and 1 reference.

SUBMITTED: April 27, 1959

Card 2/2

5(4) SOV/20-127-2-41/70
AUTHORS: Plaksin, I. N., Corresponding Member AS USSR, Shafeyev, R. Sh.
TITLE: Effect of Iodine on the Floatability of Sulfide Minerals
PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 127, Nr 2, pp 384-385
(USSR)
ABSTRACT: According to reference 1 iodine exhibits a natural floatability, and in this respect is comparable to elementary sulphur, as in both these elements the intermolecular forces are feeble as compared to the interatomic forces. To test the effect of iodine as a concentrating reagent, an investigation was first made of the iodine adsorption by sulfide minerals (Table 1). The effect of iodine on flotation was investigated in a flotation machine with a chamber of 100 ml capacity. Mixing with iodine was done for three min, and flotation also took three min. Xanthogenate and iodine were added separately. Results are given in table 3. Iodine enters reaction with xanthogenate. This was proven by experiments with iodine and S³⁵-marked butyl xanthogenate (Table 3).

Card 1/2

SOV/20-125-3-37/63
On the Problem of the Mechanism Underlying the Formation of Electrochemical
Heterogeneity on the Surface of Sulphide Minerals

ASSOCIATION: Institut gornogo dela Akademii nauk SSSR (Mining Institute of
the Academy of Sciences, USSR)

SUBMITTED: December 24, 1958

Card 4/4